contents

july 1990
volume 58
number 1

1 Changes in membrane structure induced by electroporation as revealed by rapid-freezing electron microscopy
Donald C. Chang and Thomas S. Reese

13 Study of mechanisms of electric field induced DNA transfection I. DNA entry by surface binding and diffusion through membrane pores
Ting-Dong Xie, Lei Sun, and Tian Yow Tsong

21 Kinetics of the lamellar and hexagonal phase transitions in phosphatidylethanolamine. Time-resolved x-ray diffraction study using a microwave-induced temperature jump
Martin Caffrey, Richard L. Magin, Bernard Hummel, and Jian Zhang

31 Tracer diffusion in F-actin and Ficoll mixtures. Toward a model for cytoplasm
Li Hou, Frederick Lanni, and Katherine Luby-Phelps

45 One- and two-dimensional proton NMR studies of cys-102 *S*-methylated yeast isozyme-1 ferricytochrome *c*
Scott C. Busse, Susan J. Moench, and James D. Satterlee

53 Kinetic analysis of phasic inhibition of neuronal sodium currents by lidocaine and bupivacaine
Daniel M. Chernoff

69 Kinetics of local anesthetic inhibition of neuronal sodium currents. pH and hydrophobicity dependence
Daniel M. Chernoff and Gary R. Strichartz

83 Bacteriorhodopsin wildtype and variant aspartate-96 → aspargine as reversible holographic media
Norbert Hampp, Christoph Bräuchle, and Dieter Oesterhelt

95 pH-dependent binding of local anesthetics in single batrachotoxin-activated Na^+ channels. Cocaine vs. quaternary compounds
Jilda Nettleton and Ging Kuo Wang

107 Receptor-mediated adhesion phenomena. Model studies with the Radial-Flow Detachment Assay
Cindi Cozens-Roberts, John A. Quinn, and Douglas A. Lauffenburger

127 Interstitial sodium nuclear magnetic resonance relaxation times in perfused hearts
Brent D. Foy and Deborah Burstein

135 Subpicosecond resonance Raman spectra of the early intermediates in the photocycle of bacteriorhodopsin
R. van den Berg, Du-Jeon-Jang, Herbert C. Bitting, and M. A. El-Sayed

143 Frequency domain analysis of membrane capacitance of cultured cells (HeLa and myeloma) using the micropipette technique
K. Asami, Y. Takahashi, and S. Takashima

149 Electron paramagnetic resonance investigation of photosynthetic reaction centers from *Rhodobacter sphaeroides* R-26 in which Fe^{2+} was replaced by Cu^{2+} Determination of hyperfine interactions and exchange and dipole–dipole interactions between Cu^{2+} and Q_A^-
R. Calvo, M. C. G. Passeggi, R. A. Isaacson, M. Y. Okamura, and G. Feher

167 Theoretical nuclear magnetic resonance–lineshape study of a two-site chemical exchange model of sodium ions ($I = 3/2$) in an intracellular environment
Elisabet Berggren and Per-Olof Westlund

177 Reactions of excited triplet states of metal substituted myoglobin with dioxygen and quinone
Sandor Papp, J. M. Vanderkooi, C. S. Owen, G. R. Holtom, and C. M. Phillips

187 Dynamics of the phosphate group in phospholipid bilayers. A ^{31}P-^1H transient Overhauser effect study
M. P. Milburn and K. R. Jeffrey

195 Surface dipole moments of lipids at the argon-water interface. Similarities among glycerol-ester-based lipids
J. M. Smaby and H. L. Brockman

205 Evidence that lipid lateral phase separation induces functionally significant structural changes in the Ca^{2+}-ATPase of the sarcoplasmic reticulum
Francisco J. Asturias, Donatella Pascolini, and J. Kent Blasie

219 Glutamate receptor-channel gating. Maximum likelihood analysis of gigaohm seal recordings from locust muscle
S. E. Bates, M. S. P. Sansom, F. G. Ball, R. L. Ramsey, and P. N. R. Usherwood

231 Saturation transfer electron spin resonance of Ca^{2+}-ATPase covalently spin-labeled with β-substituted vinyl ketone- and maleimide-nitroxide derivatives. Effects of segmental motion and labeling levels
László I. Horváth, László Dux, H. Olga Hankovszky, Kálmán Hideg, and Derek Marsh

243 Temperature dependence of the low frequency dynamics of myoglobin. Measurement of the vibrational frequency distribution by inelastic neutron scattering
Stephen Cusack and Wolfgang Doster

brief communications

253 Stimulus-activated conductance in isolated taste epithelial membranes
John H. Teeter, Joseph G. Brand, and Takashi Kumazawa

261 On the measurement of particle number and mobility in nonideal solutions by fluorescence correlation spectroscopy
James R. Abney, Bethe A. Scalettar, and Charles R. Hackenbrock

267 Stroboscopic nuclear magnetic resonance microscopy of arterial blood flow
Ronald W. Behling, Helen K. Tubbs, Michael D. Cockman, and Lynn W. Jelinski

273 Fluid phase connectivity in an isomorphous, two-component, two-phase phosphatidylcholine bilayer
Winchil L. C. Vaz, Eurico C. C. Melo, and Thomas E. Thompson

277 Effects of headgroup methylation and acyl chain length on the volume of melting of phosphatidylethanolamines
Jeffrey T. Mason and Timothy J. O'Leary

283 Correction

august 1990
volume 58
number 2

289 Optimizing planar lipid bilayer single-channel recordings for high resolution with rapid voltage steps
W. F. Wonderlin, A. Finkel, and R. J. French

299 Long-range interactions in mammalian platelet aggregation. I. Evidence from kinetic studies in Brownian diffusion
Kimberly Longmire and Mony Frojmovic

309 Long-range interactions in mammalian platelet aggregation. II. The role of platelet pseudopod number and length
Mony Frojmovic, Kimberly Longmire, and Theo G. M. van de Ven

319 Cytoplasmic strains and strain rates in motile polymorphonuclear leukocytes
Scott I. Simon and Geert W. Schmid-Schönbein

333 Allosteric kinetics and equilibria differ for carbon monoxide and oxygen binding to hemoglobin
Nianqing Zhang, Frank A. Ferrone, and Anthony J. Martino

341 Visualization of transport-related configurations of the nuclear pore transporter
Christopher W. Akey

357 Physical properties of single phospholipid bilayers adsorbed to micro glass beads. A new vesicular model system studied by ^2H-nuclear magnetic resonance
Thomas M. Bayerl and Myer Bloom

363 Resolution of the fluorescence decay of the two tryptophan residues of *lac* repressor using single tryptophan mutants
Catherine A. Royer, Joseph A. Gardner, Joseph M. Beechem, Jean-Claude Brochon, and Kathleen S. Matthews

379 Orientation and lateral mobility of cytochrome c on the surface of ultrathin lipid multilayer films
James M. Pachence, Suzanne Amador, Grzegorz Maniara, Jane Vanderkooi, P. Leslie Dutton, and J. Kent Blasie

391 Model of ion transport regulation in chloride-secreting airway epithelial cells. Integrated description of electrical, chemical, and fluorescence measurements
Thomas Hartmann and A. S. Verkman

403 Permanent dipole moment of tRNA's and variation of their structure in solution
Dietmar Porschke and Jan Antosiewicz

413 Slow rotational mobilities of antibodies and lipids associated with substrate-supported phospholipid monolayers as measured by polarized fluorescence photobleaching recovery
Melanie M. Timbs and Nancy L. Thompson

429 Conformational substates and motions in myoglobin. External influences on structure and dynamics
Mi Kyung Hong, David Braunstein, Benjamin R. Cowen, Hans Frauenfelder, Icko E. T. Iben, Judith R. Mourant, Pal Ormos, Rinhard Scholl, Alfons Schulte, Peter J. Steinbach, Ai-Hue Xie, and Robert D. Young

437 Vibrational fluctuations of hydrogen bonds in a DNA double helix with alternating TA type inserts
R. Beger, Y. Feng, and E. W. Prohofsky

447 Magnetically orientable phospholipid bilayers containing small amounts of a bile salt analogue, CHAPSO
Charles R. Sanders II and James H. Prestegard

461 Cooperative polymerization of photosynthetic pigments in formamide-water solution
J. R. E. Fisher, V. Rosenbach-Belkin, and A. Scherz

471 Direct binding of verapamil to the ryanodine receptor channel of sarcoplasmic reticulum
Hector H. Valdivia, Carmen Valdivia, Jianjie Ma, and Roberto Coronado

483 Intracellular water in Artemia cysts (brine shrimp). Investigations by deuterium and oxygen-17 nuclear magnetic resonance
S. R. Kasturi, P. K. Seitz, D. C. Chang, and C. F. Hazlewood

493 Octopus photoreceptor membranes. Surface charge density and pK of the Schiff base of the pigments
Yiannis Koutalos, Thomas G. Ebrey, Hilary R. Gilson, and Barry Honig

503 Relative ligand binding to small or large aggregates measured by scanning correlation spectroscopy
P. R. St-Pierre and N. O. Petersen

513 Rat cerebral cortical synaptoneurosomal membranes. Structure and interactions with imidazobenzodiazepine and 1,4-dihydropyridine drugs
J. Moring, W. J. Shoemaker, V. Skita, R. P. Mason, H. C. Hayden, R. M. Salomon, and L. G. Herbette

533 Molecular dynamics of an in vacuo model of duplex d(CGCGAATTCGCG) in the B-form based on the amber 3.0 force field
Jayashree Srinivasan, Jane M. Withka, and D. L. Beveridge

549 Magnetic polarity fractions in magnetotactic bacterial populations near the geomagnetic equator
F. F. Torres de Araujo, F. A. Germano, L. L. Goncalves, M. A. Pires, and R. B. Frankel

557 Muscle stiffness measured under conditions simulating natural sound production
Lynn E. Dobrunz, Dominic G. Pelletier, and Thomas A. McMahon

brief communications

567 Single-channel recordings of two types of calcium channels in rat pancreatic β-cells
Salvador Sala and Donald R. Matteson

september 1990
volume 58
number 3

577 Pore formation kinetics in membranes, determined from the release of marker molecules out of liposomes or cells
Gerhard Schwarz and Charles H. Robert

585 Changes in ionic selectivity with changes in density of water in gels and cells
Philippa M. Wiggins and René T. van Ryn

597 Quantum efficiency of the photochemical cycle of bacteriorhodopsin
R. Govindjee, S. P. Balashov, and T. G. Ebrey

609 Phase resetting of embryonic chick atrial heart cell aggregates. Experiment and theory
John R. Clay, Richard M. Brochu, and Alvin Shrier

623 Effects of tetrodotoxin on heart cell aggregates. Phase resetting and annihilation of activity
Alvin Shrier, John R. Clay, and Richard M. Brochu

631 Exact solution of a model of diffusion in an infinite chain or monolayer of cells coupled by gap junctions
S. V. Ramanan and P. R. Brink

641 Cell-cell conjugation. Transient analysis and experimental implications
Aydin Tozeren

653 Influence of an electrical potential on the charge transfer kinetics of bacteriorhodopsin
Christoph Kleinschmidt and Benno Hess

665 Resonance energy transfer from a cylindrical distribution of donors to a plane of acceptors. Location of apo-B 100 protein on the human low-density lipoprotein particle
Philippe Bastiaens, Anthony de Beus, Michael Lacker, Pentti Somerharju, Matti Vauhkonen, and Josef Eisinger

677 Kinetics of premelting ($L_{\beta'}$-$P_{\beta'}$) and main transition ($P_{\beta'}$-L_{α}) in hydrated dipalmitoylphosphatidylcholine. A time-resolved x-ray diffraction study using microwave-induced temperature-jumps
Martin Caffrey, Gary Fanger, Richard L. Magin, and Jian Zhang

687 Large-scale structural changes in the sarcoplasmic reticulum ATPase appear essential for calcium transport
J. K. Blasie, D. Pascolini, F. Asturias, L. G. Herbette, D. Pierce, and A. Scarpa

695 Theoretical description of the spatial dependence of sickle hemoglobin polymerization
Huan Xiang Zhou and Frank A. Ferrone

705 Phase accuracy in high-resolution electron microscopy of trigonal and orthorhombic purple membrane
P. A. Bullough and R. Henderson

713 Mapping of collision frequencies for stearic acid spin labels by saturation-recovery electron paramagnetic resonance
Jun-Jie Yin, Jim B. Feix, and James S. Hyde

721 Cross-correlated photon scattering during the photocycle of bacteriorhodopsin
József Czégé and Lou Reinisch

731 Yet another approach to the dwell-time omission problem of single-channel analysis
Serge C. Crouzy and Frederick J. Sigworth

745 Small angle neutron scattering studies of HbA in concentrated solutions
S. Krueger, S.-H. Chen, J. Hofrichter, and R. Nossal

759 Limitations of the whole cell patch clamp technique in the control of intracellular concentrations
Richard T. Mathias, Ira S. Cohen, and Carlos Oliva

brief communications

771 A polymorphism peculiar to bipolar actin bundles
Noreen R. Francis and David J. DeRosier

777 Mixing behavior of identical molecular weight phosphatidylcholines with various chain-length differences in two-component lamellae
Robert B. Sisk, Zhao-qing Wang, Hai-nan Lin, and Ching-hsien Huang

785 Early regulation of membrane excitability by ras oncogene proteins
C. Collin, A. G. Papageorge, M. Sakakibara, P. L. Huddie, D. R. Lowy, and D. L. Alkon

791 A novel action of isoproterenol to inactivate a cardiac K^+ current is not blocked by beta and alpha adrenergic blockers
Cinzia Tromba and Ira S. Cohen

797 I_K inactivation in squid axons is shifted along the voltage axis by changes in the intracellular pH
John R. Clay

803 Molecular dynamics simulation by atomic mass weighting
Boryeu Mao andAlan R. Friedman

807 Analysis of the nucleation and crystal growth kinetics of lysozyme by a theory of self-assembly
Mitsuo Ataka and Michihiko Asai

813 Correction

october 1990
volume 58
number 4

817 Fluorescence lifetime distributions in human superoxide dismutase. Effect of temperature and denaturation
N. Rosato, E. Gratton, G. Mei, and A. Finazzi-Agro

823 Electroporation of the photosynthetic membrane. A study by intrinsic and external optical probes
Yosef Rosemberg and Rafi Korenstein

833 Nystatin-induced liposome fusion. A versatile approach to ion channel reconstitution into planar bilayers
Dixon Woodbury and Christopher Miller

841 Receptor-mediated cell attachment and detachment kinetics. I. Probabilistic model and analysis
Cindi Cozens-Roberts, Douglas A. Lauffenburger, and John A. Quinn

857 Receptor-mediated cell attachment and detachment kinetics. II. Experimental model studies with the radial-flow detachment assay
Cindi Cozens-Roberts, John A. Quinn, and Douglas A. Lauffenburger

873 Quantification of transport and binding parameters using Fluorescence Recovery After Photobleaching. Potential for in vivo applications
Eric N. Kaufman and Rakesh K. Jain

887 Membrane fluidity changes of liposomes in response to various odorants. Complexity of membrane composition and variety of adsorption sites for odorants
Makoto Kashiwayanagi, Asako Suenaga, Shuichi Enomoto, and Kenzo Kurihara

897 Study of mechanisms of electric field-induced DNA transfection II. Transfection by low-amplitude, low-frequency alternating electric fields
Ting-Dong Xie and Tian Y. Tsong

905 A physical model of microtubule sliding in ciliary axonemes
Michael E. J. Holwill and Peter Satir

919 Chemotaxis of bacteria in glass capillary arrays. Escherichia coli, motility, microchannel plate, and light scattering
Howard C. Berg and Linda Turner

931 Subpicosecond resonance Raman spectroscopy of carbonmonoxy- and oxyhemoglobin
R. van den Berg and M. A. El-Sayed

939 Electrostatic properties of fiber cell membranes from the frog lens
Louis R. Pasquale, Richard T. Mathias, LeeAnn R. Austin, Peter R. Brink, and Michael Ciunga

947 Dynamic motions of 1,6-Diphenyl-1,3,5-hexatriene in interdigitated C(18):C(10)phosphatidylcholine bilayers
Yvonne Lin Kao, Parkson Lee-Gau Chong, and Ching-hsien Huang

957 High voltage redox properties of cytochrome c oxidase
Richard W. Hendler, G. S. Sidhu, and K. Pardhasaradhi

969 Michaelis-Menten equation for an enzyme in an oscillating electric field
Baldwin Robertson and R. Dean Astumian

975 A simple model for multi-ion permeation. Single-vacancy conduction in a simple pore model
Mark F. Schumaker and Roderick MacKinnon

985 Domain model for Ca^{2+}-inactivation of Ca^{2+} channels at low-channel density
Arthur Sherman, Joel Keizer, and John Rinzel

997 Elastic deformation and failure of lipid bilayer membranes containing cholesterol
David Needham and Rashmi S. Nunn

1011 Plastoquinol diffusion in linear photosynthetic electron transport
Rown Mitchell, Andreas Spillmann, and Wolfgang Haehnel

1025 Dynamics of oxygen unloading from sickle erythrocytes
Vinod B. Makhijani, Giles R. Cokelet, and Alfred Clark, Jr.

brief communications

1053 Schwan equation and transmembrane potential induced by alternating electric field
Piotr Marszalek, D.-S. Liu, and Tian Y. Tsong

1059 Ca channel gating during cardiac action potentials
Michele Mazzanti and Louis J. DeFelice

1067 Monomer diffusion into polymer domains in sickle hemoglobin
Michael R. Cho and Frank A. Ferrone

november 1990
volume 58
number 5

1077 Direct determination of crystallographic phases for diffraction data from phospholipid multilamellar arrays
Douglas L. Dorset

1089 Electropermeabilization of mammalian cells. Quantitative analysis of the phenomenon
Marie-Pierre Rols and Justin Teissié

1099 Density fluctuations in saturated phospholipid bilayers increase as the acyl-chain length decreases
John Hjort Ipsen, Kent Jørgensen, and Ole G. Mouritsen

1109 Fluorescence measurements of fusion between human erythrocytes induced by poly(ethylene glycol)
Shi Kun Huang and Sek Wen Hui

1119 Effect of lateral mobility of fluorescent probes in lipid mixing assays of cell fusion
Shi Kun Huang, Ming Chen, and Sek Wen Hui

1127 Quantum efficiencies of bacteriorhodopsin photochemical reactions
Aihua Xie

1133 Ion-water and ion-polypeptide correlations in a gramicidin-like channel. A molecular dynamics study
Peter C. Jordan

1157 Diffusion and redistribution of lipid-like molecules between membranes in virus-cell and cell-cell fusion systems
Robert J. Rubin and Yi-der Chen

1169 Holding potential affects the apparent voltage-sensitivity of sodium channel activation in crayfish giant axons
Peter C. Ruben, John G. Starkus, and Martin D. Rayner

1183 Fluctuations, exchange processes, and water diffusion in aqueous protein systems. A study of bovine serum albumin by diverse NMR techniques
R. Kimmich, T. Gneiting, K. Kotitschke, and G. Schnur

1199 Structural and dielectric properties of synthetic glycolipids in mixtures with water
Reiner Zorn, Michael Grünert, Oswald Lockhoff, and Günter Nimtz

1207 Gramicidins A, B, and C form structurally equivalent ion channels
Douglas B. Sawyer, Linda P. Williams, William L. Whaley, Roger E. Koeppe II, and Olaf S. Anderson

1213 Correlation analysis of gap junction lattice images
G. E. Sosinsky, T. S. Baker, D. L. D. Caspar, and D. A. Goodenough

1227 Temporal filtering in retinal bipolar cells. Elements of an optimal computation?
William Bialek and W. Geoffrey Owen

1235 Binding of a monoclonal antibody and its Fab fragment to supported phospholipid monolayers measured by total internal reflection fluorescence microscopy
Mary Lee Pisarchick and Nancy L. Thompson

1251 Immobilized proteins in buffer imaged at molecular resolution by atomic force microscopy
A. L. Weisenhorn, B. Drake, C. B. Prater, S. A. C. Gould, P. K. Hansma, F. Ohnesorge, M. Egger, S.-P. Heyn, and H. E. Gaub

1259 Effect of integral membrane proteins on the lateral mobility of plastoquinone in phosphatidylcholine proteoliposomes
Mary F. Blackwell and John Whitmarsh

1273 Osmotic compression and stiffness changes in relaxed skinned cardiac myocytes in PVP-40 and Dextran T-500
Kenneth P. Roos and Allan J. Brady

1285 Adsorption to dipalmitoylphosphatidylcholine membranes in gel and fluid state: pentachlorophenolate, dipicrylamine, and tetraphenylborate
Pavel Smejtek and Shanru Wang

brief communications

1295 Probing visual transduction in a plant cell. Optical recording of rhodopsin-induced structural changes from *Chlamydomonas reinhardtii*
Rainer Uhl and Peter Hegemann

1303 Lateral diffusion in a mixture of mobile and immobile particles. A Monte Carlo study
Michael J. Saxton

1307 Fast activation of cardiac Ca^{++} channel gating charge by the dihydropyridine agonist, BAY K 8644
Ira R. Josephson

1313 Fractal mechanisms for the allosteric effects of proteins and enzyme
Houqiang Li, Shuhua Chen, and Huaming Zhao

1321 Surface diffusion of the interacting proteins. Effect of concentration on the lateral mobility of adsorbed bovine serum albumin
Robert D. Tilton, Alice P. Gast, and Channing R. Robertson

december 1990
volume 58
number 6

Introduction
T. E. Thompson, editor

1333 Remembrances of past editors

1355 International lecture: Molecular tools to elucidate problems in excitation-contraction coupling
David H. MacLennan

1367 Primary structure of peptides and ion channels. Role of amino acid side chains in voltage gating of melittin channels
M. T. Tosteson, O. Alvarez, W. Hubbell, R. M. Bieganski, C. Attenbach, L. H. Caporales, J. J. Levy, R. F. Nutt, M. Rosenblatt, and D. C. Tosteson

1377 Computation of actin potential propagation and presynaptic bouton activation in terminal arborizations of different geometries
H.-R. Lüscher and J. S. Shiner

1389 Simulation of actin potential propagation in complex terminal arborizations
H.-R. Lüscher and J. S. Shiner

1401 Hydrostatic compression in glycerinated rabbit muscle fibers
K. W. Ranatunga, N. S. Fortune, and M. A. Geeves

1411 Estimating kinetic parameters for single channels with simulation. A general method that resolves the missed event problem and accounts for noise
Karl L. Magleby and David S. Weiss

1427 Normal band 3-cytoskeletal interactions are maintained on tanktreading erythrocytes
Frances E. Weaver, Heike Polster, Peter Febboriello, Michael P. Sheetz, Holger Schmid-Schonbein, and Dennis E. Koppel

1437 Direct visualization of phosphorylase-phosphorylase kinase complexes by scanning tunneling and atomic force microscopy
Ronald D. Edstrom, Marilyn H. Meinke, Xiuru Yang, Rui Yang, Virgil Elings, and D. Fennell Evans

1449 Magic-angle spinning NMR studies of molecular organization in multibilayers formed by 1-octadecanoyl-2-decanoyl-*sn*-glycero-3-phosphocholinet
Helen N. Halladay, Ruth E. Stark, Shaukatok Ali, and Robert Bittman

1463 Calorimetric studies of the state of water in seed tissues
Christina W. Vertucci

1473 Imaging the membrane protein bacteriorhodopsin with the atomic force microscope
Hans-Jürgen Butt, Kenneth H. Downing, and Paul K. Hansma

1481 Aminopyridines block an inactivating potassium current having slow recovery kinetics
P. Kay Wagoner and Gerry S. Oxford

1491 Intracellular diffusion, binding, and compartmentalization of the fluorescent calcium indicators indo-1 and fura-2
L. A. Blatter and W. G. Wier

1501 General analysis of receptor-mediated viral attachment to cell surfaces
T. J. Wickham, R. R. Granados, H. A. Wood, D. A. Hammer, and M. L. Shuler

1517 Effects of lateral diffusion on the fluorescence anisotropy in hexagonal lipid phases. I. Theory
B. Wieb Van Der Meer, Kwan Hon Cheng, and Sun-Yung Chen

1527 Effects of lateral diffusion on the fluorescence anisotropy in hexagonal lipid phases. II. An experimental study
Sun-Yung Chen, Kwan Hon Cheng, B. Wieb Van Der Meer, and Joseph M. Beechem

1539 Polarized Fourier transform infrared spectroscopy of bacteriorhodopsin. Transmembrane alpha helices are resistant to hydrogen/deuterium exchange
Thomas N. Earnest, Judith Herzfeld, and Kenneth J. Rothschild

1547 Thermodynamical and structural information on photosynthetic systems obtained from electroluminescence kinetics
Marten H. Vos and Hans J. van Gorkom

letter to the editor

1557 Mechanical coupling of zymogen granule membrane with the granule core
D. P. L. Green